REMARKS

INTRODUCTION

Claims 1-32 were previously and are currently pending and under consideration.

REJECTIONS UNDER 35 USC § 102

In the Office Action, at pages 2-6, claims 1-4, 12-15, 23 and 24 were rejected under 35 U.S.C. § 102 as anticipated by Spight. This rejection is traversed and reconsideration is requested.

SPIGHT DOES NOT DISCLOSE OR SUGGEST (1) SAME IMAGE CAPTURING DEVICE CAPTURING BOTH IMAGE DATA OF OBJECTS AND IMAGES OF REFERENCE MODELS OR (2) STORING A CAPTURING DIRECTION OF THE REFERENCE IMAGE AND INFORMATION OF AN ORIENTATION OF THE ROBOT WITH RESPECT TO THE REFERENCE OBJECT

Claim 1 recites "a first image capturing device capturing image data of the plurality of objects containing respective images of the objects". Claim 1 also recites "a memory storing reference models, each comprising an image of a reference object captured by said image capturing device in a different direction". Because the same image capture device has been used, matching and orientation determination may become simple and accurate.

The Spight reference does not provide any explanation of how to derive its configuration data (in memory) used go generate reference signals. A fundamental feature of Spight is that "system control processor 64 recalls from its memory data indicative of a reference object or desired object to be identified" (column 6, lines 41-44). Spight also mentions that "the scene being viewed is closely approximated by the computer reproduced reference scene" (column 7, lines 44-46). "[T]he system control processor 64 recalls reference view information from memory located in the system control processor 64" (column 9, lines 29-31). Spight stores data in memory that can be converted to an optical signal for optical correlation processing. However, as discussed below, Spight does not disclose or suggest how the reference data is obtained. The only teaching in Spight is that "the plurality of reference of signals could be produced by computer generated rotation of translation images of each object to be identified" (column 9, lines 17-19).

Applicant offers the following summary of reference models in Spight. Based on a complete review of Spight including the portions cited above, Spight discloses only two teachings about reference data in computer memory.

First, Spight generally discloses that "a plurality of configurations of each desired object would be stored in the system control processor 64 (column 9, lines 6-8). Each configuration would be used to generate a corresponding reference signal (column 9, lines 10-13). However, in this first teaching Spight is completely silent on (1) how the configurations are obtained (there is no suggestion of using the same capture device used to capture the object image), and on (2) storing a capturing direction of the reference image and information of an orientation of the robot with respect to the reference object. This first teaching of Spight is so general that the rejection can only stand by distillation of claim 1 to its basic gist or thrust. However, according to MPEP § 2142.02, "[d]istilling an invention down to the 'gist' or 'thrust' of an invention disregards the requirement of analyzing the subject matter 'as a whole'". The MPEP provides further guidance: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. ... The identical invention must be shown in as complete detail as is contained in the ... claim" (MPEP § 2131, emphasis added).

Applicant respectfully requests the Examiner to explain where Spight discloses or suggests, in as complete detail as in claim 1, using the same capture device for both capturing reference images and for capturing an image of the object whose identify and location is to be determined.

Applicant also requests the Examiner to explain where Spight, in as complete detail as in claim 1, discloses storing "information of the capturing direction of its associated image and information of an orientation of the robot with respect to the reference object", which "represent[]s a rotational posture of the reference object relative to the robot".

Second, Spight discloses only one technique for deriving the configuration data or reference data stored in memory (the source of the reference signals). That discussion is at column 9, lines 16-19, which states that the reference signals are produced by "computer generated rotation of the translation images of each object to be identified" (e.g. CAD-generated data). This clearly does not meet the features of claim 1 mentioned above. Furthermore, this use of computer-generated reference data (e.g. CAD-generated data) suggests that Spight can

operate without using information of the capturing direction of an associated reference image and information of an orientation of the robot with respect to the reference object relative to the robot. If the Examiner disagrees, Applicant respectfully requests an explanation of where Spight discloses details of reference models/images as discussed above with reference to claim 1.

Claim 12 recites features similar to claim 1. Claim 23 recites "storing reference images corresponding to images of the workpiece or an object so shaped (workpiece/object) and reference arrangement information indicating arrangements of the robot and workpiece/object relative to each other when the images were captured, the reference arrangements comprising rotational arrangements of the workpiece relative to the robot". As discussed above, Spight does not discuss or suggest how configurations are derived. The rejection cites "configurations" in Spight, however Spight only mentions that the configurations are stored without explaining what a configuration entails or how it is obtained. Again, the reference must disclose the same level of detail as recited in the claim.

SPIGHT DOES NOT DISCLOSE DETERMINING ORIENTATION OF ROBOT OPERATION

Claim 1, for example, recites determining orientation of a robot operation based on the image of the object, the reference model, etc. However, nowhere does Spight disclose or suggest determining the actual orientation of a robot operation. Spight discloses only that "Once the object is identified

Column 8, lines 16-37 (emphasis added):

Once the object is identified, the system control processor 64 provides this [identity] information and object position information to an effector control processor 200 which may drive a robotic effector or manipulator 202 to perform any desired task on the object being viewed. Position of the object is determined on the basis of the position of the bright points 212 viewed by the video detector 40. Because of the use of parallel optical processing which facilitates rapid iterations of the correlation between particular configurations of the object being viewed and the reference signals indicative of the object to be identified, the system of the present invention may identify the object, its location and orientation in an extremely fast, substantially real-time manner. Thus, even objects Ob moving along a conveyor line may be detected by the vision system of the present invention and identified with an understanding of the object's location and

orientation in sufficient time to perform a manipulative operation on the object via robotic effector 202 before the object is shifted, to any great extent, by the conveyor

Spight does not disclose providing object orientation information to the effector or manipulator 202. Even if Spight did provide this information, it has no teaching or suggestion of determining the orientation of a robot operation. Respectfully, there is no indication that orientation can even be used. Spight may use robot graspers such as suction cups or types of other orient-less graspers. Orientation information, if used at all, may be used to determine which type of robot hand to use, whether grasping is possible at all, whether the object needs to be agitated or otherwise moved for purpose of being grasped, and so on. As mentioned above, an anticipatory reference must disclose the same level of detail as found in the claims. The claims recite determining the orientation (or orientation and position) of the robot operation. Spight does not disclose this detail and only explicitly discloses providing object position information to the effector control processor 200.

Claims 12 and 23 recite similar features. Withdrawal of the rejection is respectfully requested.

SPIGHT LACKS PROCESSOR TO PERFORM MATCHING

Claims 1 and 12 recite "a processor to perform matching on the image data ... with each of said reference models". The rejection compares the processor to the computer 64 in Spight. However, the computer 64 in Spight does not actually perform matching on image data with reference models. Rather, in Spight correlation is performed by optical parallel processing. See column 2, line 53, to column 3, line 1, which shows that correlation is by "an optical lens system" and "use of another optical lens in order to produce a cross-correlation of the viewed scene and a desired object". Spight does disclose a processor 64, but this processor does not perform matching. Rather, the processor 64 evaluates the degree/level of optically-found correlation/matching as indicated by the optical correlation output ("system control processor then monitors the degree of correlation", column 3, lines 4-6). The processor 64 only evaluates the degree of correlation, which is not the same as performing matching itself.

In sum, Spight's processor evaluates degree of correlation, which is not actual performance of matching. Matching in Spight is performed without a processor; the processor

only decides whether the degree of matching is sufficient. This difference is notable. The type of optical system taught by Spight is expensive and inflexible. Furthermore, optical systems using lenses, splitters, and the like are not readily combined with digital systems. Therefore, one skilled in the art would find it difficult to combine Spight with non-optical systems.

Withdrawal of the rejection of claims 1 and 12 is respectfully requested.

NEW OFFICE ACTION REQUIRED

As shown above, Applicant respectfully submits that the current rejection does not explain how all of the claim limitations are met by Spight. Applicant cannot evaluate the rejection because the Examiner has not explained how various limitations in the claims are met by Spight. Applicant is in the difficult position of having to determine how to proceed procedurally in response to a Final action without clear development of the issues. As noted in MPEP § 706.07, an "applicant ... should receive the cooperation of the examiner ... and not be prematurely cut off in the prosecution of his or her application ... a clear issue between applicant and examiner should be developed, if possible, before appeal". Applicant requests a new Final Office Action addressing the claim limitations mentioned above.

REJECTIONS UNDER 35 USC § 103

In the Office Action, at page 6, claims 5 and 16 were rejected under 35 U.S.C. § 103 as being unpatentable over Spight in view of Suyama or Stauffer. This rejection is traversed and reconsideration is requested.

Claims 6, 7, 11, 17, 18 and 22 were rejected under 35 U.S.C. 103 as being unpatentable over Spight and further in view of Maeno.

Claims 8, 19, 25-27 and 30 were rejected under 35 U.S.C. 103 as being unpatentable over Spight in view of Maeno and further in view of Soderberg.

Claims 9, 10, 20, 21, 28, 29, 31 and 32 were rejected under 35 U.S.C. 103 as being unpatentable over Spight in view of Maeno and further in view of Sakakibara.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Request, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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